

## Fuel Temperature Compensation

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A hot topic in the weights and measures community is temperature compensation relative to retail motor fuel devices. What is temperature compensation?

As gasoline warms, it expands by volume but not weight or energy content. Of course, as gasoline cools, it shrinks by volume but not weight or energy content. The reference temperature for petroleum products in the United States is 60 degrees F (15.556 degrees C). If you were to measure one-gallon of gasoline at 60 degrees F, it would measure 231 cubic inches. The same gasoline measured at 80 degrees F would measure 233.7 cubic inches.

The problem with 80 degree fuel is that the measuring instrument in a fuel pump measures and you pay for 233.7 cubic inches, but when it cools in your tank, it shrinks back to 231 cubic inches when the temperature reaches 60 degrees F (see chart below). The “overcharge” is 3.2 cents per gallon based on \$2.75 a gallon.

Is that a problem in New Hampshire when the average ground temperature is about 58.5 degrees F? It's not always the ground temperature that matters, as much as the temperature of the fuel as it arrives from a 10,000 gallon trailer. If the fuel arrives “hot” from the distributor/fuel refineries, it is dumped into a well insulated underground tank. With many stations filling their storage tanks several times a week, the fuel does not get a chance to cool.

°F	Volume Correction	
	Factor gasoline	in. <sup>3</sup> /gal. gasoline
85	0.9854	234.3
80	0.9883	233.7
75	0.9912	233.0
70	0.9942	232.3
65	0.9971	231.7
<b>60</b>	<b>1.0000</b>	<b>231.0</b>
55	1.0030	230.3
50	1.0059	229.6
45	1.0088	229.0
40	1.0118	228.3
35	1.0147	227.6
30	1.0176	227.0

The technology exists to enable gas pumps to compensate for this expansion and contraction. Notwithstanding all of the discussion on this recently, as well as proposed federal legislation on the matter, no major move is anticipated towards temperature compensation on retail motor fuel pumps in the near future.

Temperature compensation has been an ongoing event for heating oil dealers on the retail level for several years. A recent survey of heating oil companies show that about 40% of all heating oil companies are compensating for temperature at the meter on the day of delivery. In order to ensure fairness, companies that decide to compensate must do so on all their oil meters for a period of one year.

Does your oil dealer compensate for temperature? Look at your delivery ticket. If compensation is happening, it should say the following, “the volume delivered has been adjusted to the volume of 60 degree Fahrenheit.”

If you have any further questions or comments, please feel free to contact the Division of Weights and Measures at 271-3700 or email at [rcote@agr.state.nh.us](mailto:rcote@agr.state.nh.us).

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